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watched the rising of the moon, to indulge myself with a solitary ramble among the ruins by her light, so favourable to contemplation; and I was well rewarded. The strange gigantic figures on the portals near which we were encamped, had a singular and portentous aspect, faintly illuminated by the moon, and by the remains of a fire our people had lighted, which cast a reddish mysterious light on part of them. As I walked among the lofty pillars, numberless were the fancies that arose, and the incomparable ode at once presented itself to my recollection. I was actually walking among the remains of those very 'Persian abodes,' but how changed! The fall of my own footsteps, and the cry of the fox from the hills which contain the royal sepulchres, were the only sounds heard, while above the pale moon was pursuing her tranquil course, unconscious of, or at least unchanged by, the lapse of ages."

The dreadful irruption of cholera at Shirauz, in the midst of the nuptial feast of a royal pair,—

" 'Who is it that comes from the bridal chamber? It is Azrael, the Angel of Death.' The festivities of the wedding were suddenly put a stop to by the appearance of the so-much-dreaded cholera. The first death by it happened on the 14th. * * * *

"I hope to take Shapoor on my way to Bushire, for which I shall set out in a few days, please God."

Such was not the will of God. His days were numbered. Mr. Rich died of the cholera morbus on the 5th Oct., 1821, at the early age of thirty-four years.

* * * * *

Besides the journey here described, the Appendix contains a valuable collection of fragments of routes, of observations, and of bearings and distances throughout his routes; affording most valuable materials for filling up the blank in our maps. In the maps accompanying the books, especially that on the large scale, Mr. Walker has made use of these materials with great judgment; and we hope ere long to see the information, which bears on its face the stamp of veracity, transferred to all our maps of Koordistan.

II.—*Reise um die Erde in den Jahren, 1830, 31, und 32.* Von Dr. F. J. F. Meyen. Berlin, 1834. (*Voyage round the World in the years 1830, 31, and 32.* By Dr. F. J. F. Meyen. Berlin, 1835.) 2 vols. 4to.

THE author of this voyage, a zealous naturalist, accompanied as surgeon the Prussian vessel, *Princess Louise*, which sailed from Hamburg in September, 1830, for the west coast of South America, and for China, on commercial speculations. The vessel touched at Rio Janeiro; Valparaiso and Copiapò in Chile; Arica, Islay, and

Callao in Peru ; afterwards sailed to the Sandwich Islands, thence to Canton and Manila, and returned to Europe by the Cape of Good Hope. The stay of the vessel at each place was, of course, limited to a few weeks. Yet the author has considerably increased our knowledge of the natural history, as well as of the geography, of the countries which he visited. He obtained this object by an indefatigable activity, so frequently met with in naturalists, and more especially in German naturalists ; and by a great desire to see such parts of these countries which previously had not been visited by European travellers, or of which, at least, no account could be found in their travels.

At Rio Janeiro his stay was very short ; and as, during the last twenty years, not less than ten travellers have given an account of the capital of Brazil, he could not add to our stock of geographical knowledge, though his endeavours to enrich natural history were more successful.

From Valparaiso he went to Santiago ; from thence he travelled southward to San Fernando, the capital of the province of Colchagua, which lies about eighty miles farther south, but nearly under the same meridian ; and from here he visited the Andes and ascended Monte Imposible.* The plain of Mapocho, on which Santiago is built, and which is about 1700 feet above the level of the sea, terminates about ten miles south of the town, where there rise isolated pyramidal hills of green-stone porphyry to two or three hundred feet. They afterwards increase in number and form small chains. These elevations constitute the southern boundary of the plain of Mapocho ; south of it extends another not less extensive plain, which is more fertile and traversed by the Rio Maipù ; it seems to be very much lower than that of Mapocho. The bed of the river Maipù, where it is crossed by the road, was half a league wide, though it was at the end of the dry season, and the water very low. South of the Maipù the country is still more fertile, the annual rains being more abundant. The plain extends to a considerable distance from the river, and has for its southern boundary the Cuesta de Perigne, a chain of hills about 700 feet above the plain, which is traversed by a narrow pass, called La Angostura. Then follows the plain of Rancagua, which, like the other, extends along the foot of the Andes ; and on the west is enclosed by ridges of low hills. The Rio Cachapoal, which runs through it, is, at the town of Rancagua, wider than the Maipù, but the water did then not fill the whole of its bed, but was divided in four or five wide water-courses. The small streams descending from the Andes are very numerous : the most considerable is the Rio Clarillo, a

* This name does not appear in any of our maps, but in Dr. Meyen's it appears to overhang the pass of Las Damas.

tributary to the Cachapoal. South of this the ground rises to an inconsiderable height, and is traversed by a narrow pass extending about five miles. Then follows another plain, in which is situated the town of S. Fernando, the capital of the province of Colchagua.

From hence Dr. Meyen undertook an excursion into the Andes, along the Rio Tinguiririca, towards the pass of Las Damas. The plain rises suddenly fifty or sixty feet, and continues at that elevation on a level to the very foot of the range. The mountains rise here with great steepness, forming in some places almost perpendicular walls of sienite, rising upwards of 1000 feet. On their summits occur plains of small extent: the lower portions of them, where the declivity is not too steep, are clad with high forest trees; higher up, they are covered with shrubs. Only the middle of the chain of the Andes consists of bare rocky masses, which rise to the snow-line, or nearly so. *Monte Imposible* was at this season (February) covered with snow. The higher part of the mountain consists of a greyish-green porphyry, with numerous and large crystals of hornblende.

Dr. Meyen afterwards visited the Volcan de Maipù, near the source of the river of the same name, whose banks the road follows. The hills and lower mountains, which enclose its channel are clad with trees and rich vegetation. Between the mountains, and three leagues above the junction of the river Colorado, is a fine and wide valley, in which is situated the Villa San José. Beyond the mountains again approach the banks of the Maipù; and in them some mines of silver, close to the road, which, by the pass of Portillo, between Tupungato, on the north, and Maipù, on the south, leads to Mendoza. At Tollo, a small village, Dr. Meyen saw a hill 300 feet high, entirely composed of pumice-stone. It is two days' journey distant from the volcano of Maipù, and no other is found in its neighbourhood. About five leagues from Tollo, the narrow glen, through which the river runs, widens to a pretty valley, which is covered with the fruit-trees of Europe, its elevation being so high that heavy snow-falls are frequent; and the snow remains for a considerable time on the ground. At the junction of the Rio del Yeso with the Rio Maipù, Dr. Meyen quitted the road conducting to Mendoza, and entered the mountain-passes. About two miles farther up, the Rio Maipù is joined by the Rio del Valian, which, as well as the Rio del Yeso, comes down from the north-east; but the Rio del Valian is much larger, nearly as wide as the Rio Maipù at their confluence. Here Dr. Meyen estimates the elevation of the valley at 4500 or 5000 feet above the sea. The whole course of the Rio del Valian, along which the traveller ascended, lies in a very narrow glen, whose sides are formed by high and steep mountains, on the declivities of which the road continues at a considerable height above the river. The sides of

the mountains are mostly bare ; where the valley is rather wider, are excellent pasture grounds for cattle and goats, at an elevation of about 9000 feet. At the upper extremity of this valley extends a considerable plain, which reaches to the very foot of the volcano, and is covered with a fine turf. Whilst Dr. Meyen passed the night on this plain, and also at other places, he observed successive flashes like lightning, though the sky was cloudless ; and he was informed by the natives that they proceeded from the volcanoes. He is rather at a loss to explain why this lightning is observed at the volcanoes of Chile, and not at those of other countries. The volcano of Atacama is the most northern at which this phenomenon occurs : at that of Arequipa it is not observed. Dr. Meyen could not attain the summit of the Volcan de Maipù, being prevented by a deep quebrada, or ravine, which occurs about 500 feet below its summit : the snow and ice extended more than 1000 feet lower down.

We must refer to the work for valuable remarks upon the natural history of this part of the Andes, which Dr. Meyen lost no opportunity of examining. On his return to Santiago and Valparaiso, they sailed for Coquimbo, and then to Copiapò, where he found the town, which, in 1819 and 1822 was almost destroyed by an earthquake, rebuilt, and containing 4000 inhabitants. Shocks of earthquake were so frequent, that during his stay six or seven of them commonly occurred in the space of twenty-four hours. The inhabitants are so used to these occurrences, that when they hear the slight noise by which every shock is preceded, they run directly out of doors ; as soon as the shock is passed, return and continue the conversation, as if nothing had happened. Dr. Meyen thinks that no part of America is more subject to earthquakes, and assigns as the reason for this peculiarity the entire want of volcanoes in the adjacent range of the Andes. The volcano of Copiapò, which is inserted in all our maps, does not exist, and it appears that no volcano is found between that of Coquimbo, in 30° S. latitude, and that of Atacama, nearly eight degrees farther north. Hence the countries lying between these parallels on the Pacific are continually agitated by earthquakes. It would also seem, that the Andes in this space rarely rise to the snow-line ; for it is observed by the author, that the small rivers which descend from them bring down all the year round nearly the same volume of water ; which, between the parallel of 23° and 30°, could not happen, if the mountains were covered a considerable part of the year with snow. It is also confirmed by the great number of passes, which here traverse the range ; for in the department of Copiapò alone there exist five mountain-passes, distant from each other about twenty leagues ; and many others might be opened without great expense.

The Rio de Copiapò, which waters the valley, does not reach the sea, but is lost in salt pools, about twenty miles from the port, and the whole country around is covered with a thick incrustation of salt; at some distance from it vegetation appears. Between this place and the sea the country is a complete desert. At the village of Ramadilla the water of the river becomes drinkable, and directly the whole aspect of the valley is changed, it being covered with a vigorous vegetation, as far as water reaches. The width of the valley is from one to two miles, and that of the river varies between twenty and thirty feet. A small part of the valley is cultivated, the greater being reserved as pasture for the great number of mules which are employed to bring down the produce of the mines to the port.

Dr. Meyen did not limit his excursion to the town of Copiapò, but travelled in the valley of the river up to Nantoco and Los Hornitos, upwards of thirty leagues from the sea, and about twelve leagues from the highest range of the Andes. At Los Hornitos the produce of the numerous copper-mines found in the mountains east of Copiapò is smelted. The valley is fertile, but only at a few places appeared signs of cultivation. Its elevation above the sea at Los Hornitos seems not to exceed 300 feet.

From the dispersed observations of the author we are enabled to form some idea of the country north of the valley. From the low beach of the sea the country rises suddenly to from fifty to seventy feet, and at that elevation it extends in a nearly level plain, which is called the Desert of Copiapò. Its extent towards the north is unknown, but it seems to join the great desert of Atacama. On the east it reaches to the Monte Algaroba, which runs northward parallel to the coast, at the distance of about eight leagues. East of this range the country is much higher and more uneven, its surface being traversed by low chains of hills, which unite the Algaroba to the Chanchoprin, another ridge running north and south and ending near the town of Copiapò. In the vicinity of this place, the high land enclosing the valley rises with a rather steep ascent to nearly 700 feet above the sea. Near Nantoco its elevation was estimated 1000 feet above the valley, but hence the rise is much more rapid: for at Los Hornitos the mountains attain nearly 5000 feet. Such is the slope of the western declivity in this part of South America.

The partido of Copiapò is rich in minerals. When the author was there, 103 mines were worked: 3 of gold, 24 of silver, and 75 of copper. According to his information, the produce of silver was about 600 marcs, and that of copper 10,000 quintals; the mines of Checo, belonging to an English Mining Company, gave an annual produce of 6000 quintals. The rich silver mines, situate about twenty miles south of Copiapò, in the range of

Chanarcillo and Molte, were not discovered till after his departure in 1832, and his account of them is only drawn from the report in the official newspaper of Chile.

The rich mines of Checo, which at former periods have given even 12,000 quintals, are situated on the high ground north of Nantoco, at a distance of about three leagues, in a very desolate country. The ore is very rich, containing about 70 *per cent.* of copper; nevertheless, the profit of the Company is very moderate, on account of the heavy expenses of transport. Here, as well as in other parts, good roads would much increase the value of the mines.

The most interesting part of Dr. Meyen's work is, perhaps, his journey through the valley of the Desaguadero, in the Bolivian Andes. From Arica he went to Tacna, ascended the western chain of the Andes, by the pass of Las Gualillas, and traversed the high table-land to the great lake of Titicaca, whose banks he reached near the village of Ilave. Hence, along the banks of the lake to Puno, and returned, through Arequipa, to the port of Islay, re-crossing the western chain of the Bolivian Andes by the pass called Altos de Toledo.

Arica, though much resorted to by trading vessels, is a miserable place, only inhabited by people of mixed race, and abandoned by the whites on account of its unhealthiness. Here the goods are landed which are destined for the markets of Bolivia, and of a portion of Peru. The road from Arica to Tacna leads over a desert covered with gravel; not a rock to be seen, and hardly any traces of vegetation. It seems to rise rapidly; for Tacna is, according to Mr. Pentland, 1795 feet above the level of the sea. It lies in a valley from two to three miles wide, and watered by the small river of the same name; it is richly covered with vegetation, and presents a great contrast to the deserts around. Tacna is better built than most of the smaller towns of South America, and contains about 10,000 inhabitants, nearly exclusively occupied in carrying on the commerce between the coast and Bolivia.

Dr. Meyen ascended the valley for one day's journey from Tacna, but found the vegetation in it scanty, whilst the surrounding hills were bare. Beyond the small village of Patchi the road began to ascend the lower declivity of the Andes; the country bare and covered with masses of rock. Higher up in a narrow and deep quebrada, covered with a rich vegetation of trees and plants, the village of Palca is situated, whose inhabitants cultivate the declivities of the ravine; and the temperature allows them to keep llamas. Near this place Dr. Meyen observed some solid quadrangular buildings, about twenty feet high, and eight feet square. They were built of bricks, dried in the sun, and were bound together by metallic bands. The Indians inhabiting the

village said that they had been erected in the time of the Incas ; possibly the stone masses, which, according to Herrera, the Inca Topa erected as memorials of his victories over the rebellious inhabitants of this country.

On leaving the quebrada of Palca, Dr. Meyen again ascended very steep acclivities, where the small level places were not entirely without vegetation ; but trees had disappeared, and shrubs did not attain their usual size. After an ascent of a few hours he arrived on the exterior edge of the Andes, where the mountain-pass of Las Gualillas, or Guatillas, begins, which runs between the two Nevados of Tacora and Niuta. These two peaks stand near the edge of the range ; and the Nevado of Tacora is the more elevated. Dr. Meyen estimates its height at 15,200 feet ; but as he says that its upper part, to a distance of 300 or 400 feet from its summit, is covered with snow ; and, as according to the observations of Mr. Pentland, the snow-line in this portion of the Andes descends rarely below 17,000 feet ; the Nevado de Tacora must be higher.

The accounts of Mr. Pentland and Dr. Meyen do not entirely agree respecting the mountains' summits in this part of the Andes. Mr. Pentland calls Nevado de Chipicani that peak which emits quantities of aqueous acid vapours, which, by their condensation, give rise to the Rio Azufrado ; and Dr. Meyen asserts the same of the Nevado de Tacora. Hence we should infer that the Nevado de Chipicani of Mr. Pentland is the Nevado of Tacora of Dr. Meyen. But Mr. Pentland says that the village of Tacora is situated at the south-western base of the Nevado de Chipicani ; and Dr. Meyen had travelled some hours eastward from the base of his Nevado de Tacora before he arrived at the village of that name. He calls Nevado de Chipicani a peak, lying many miles farther east, and giving rise to the Rio Utchusoma. We must notice that, in Vol. V. of the Journal of the Society, Mr. Pentland assigns to the Nevado de Chipicani the elevation of 16,998 feet, whilst Dr. Meyen quotes it at 18,898 feet, from the "*Annuaire*" of 1830, probably a misprint.

"Close to these enormous mountain-masses, at the beginning of the pass, a plain extends from north to east, beyond the reach of sight, and is said to cover an area of more than 3200 square miles. It is entirely a desert, and called El Paramo. In travelling over it on the 2nd of April, between twelve and one o'clock, a very strong wind arose, which, with great force, blew down towards the coast, and produced so great a degree of cold, that I was glad to wrap a woollen cloth about my head. These cold winds cover the sky at Tacna with clouds between three and four o'clock in the afternoon, and produce the low temperature of the air along the coast of the Pacific in these parts of Peru. Towards evening they cease to blow, and are replaced by more moderate winds from the opposite quarter."

Tacora consists of a convent of Franciscan monks, and a few huts. It is, according to Mr. Pentland, 14,275 feet above the sea. Three leagues farther east is a lake of considerable extent where water-fowls abound. The temperature of the air on this table-land was at this season (April) so low, that, during the night, the rivers were covered with ice, strong enough to be safely passed in the morning on horseback.

The Rio *Utchusoma*, which issues from the Nevado of Chipicani (of Dr. Meyen), traverses the plain, and running towards south-west descends from the western declivity of the Andes, and flows at no great distance south of Tacna to the Pacific. For more than half a century much has been spoken of bringing the waters of this river to the valley of the Rio de Tacna by a canal ; but the obstacles will probably be found too great.

In proceeding along the plain, Dr. Meyen observed several other peaks, covered with snow, as well to the south, as to the north-west, which have not yet found a place on our maps. The surface of the plain is entirely formed by trachyte rocks, of a white colour, which frequently are disintegrated to such a degree that they are changed into very fine sand. Only where there are running waters the surface is covered with grass and low bushes, and affords pasture to herds of guanaco.

The route of Dr. Meyen lay to the north-east. At the end of the plain the ground rose, and soon afterwards he arrived at the Rio del Caño, a tributary of the Rio Maure, which falls into the Rio Desaguadero of the Lake of Titicaca. Though here is the line of separation of waters running west and east, the country continues to rise towards the north-east, where it joins the base of a range of mountains, which presents several snow-clad summits. "This range, which constitutes the chief watershed," says Dr. Meyen, "runs parallel to the chain of mountains which we had traversed." It would, therefore, appear that both the western as well as the eastern range of the Bolivian Andes consists of two collateral chains, of which that on the outside is the higher, and that towards the lake of Titicaca the lower. But whilst the inner ridge of the eastern range, according to Mr. Pentland, rises to an inconsiderable height above the level of the valley, and the outer ridge frequently much above the snow-line, the account of Dr. Meyen tends to impress us with the idea, that both ridges of the western range attain a great elevation, though even here the inner one seems to be the lower. These double ridges, however, have till now only been found in the ranges lying north of 17° S. lat.

After having passed the Rio Maure and the Rio Chulañano, its tributary, on the banks of which is the village Morocollo, the author arrived at the foot of the inner high ridge, where he found a high peak covered with eternal snow, whose name, however, he

was unable to learn, and which he called El Volcan Viejo. He estimated its elevation above the plain at 3000 or 4000 feet. He farther thinks that its base may be 1500 or 2000 feet above the village of Tacora, or 16,000 feet above the sea. The summit of this nevado, therefore, would be from 19,000 to 20,000 feet of perpendicular height. The vegetation at the base seemed to confirm his estimate of its elevation. For the same shrubs, which at the Altos de Toledo (which is 15,500 feet above the sea) attain an height of from one to one and half feet, are here at the base of the Volcan Viejo only from five to eight inches high. This volcano is now extinct, but the great space of the ground which at its foot is covered with lava to a distance of many miles, shows its former activity.

From this point Dr. Meyen began to descend towards the level country which surrounds the great lake of Titicaca. He passed first through the valley of the Rio de Pisacoma, which falls into the lake, and found its banks covered with hard and long grasses, similar to those of the Pampas, on the eastern side of the Andes. While at the village of Pisacoma, he discovered in the neighbouring mountains the wild potato-plant. It had finished blossoming, and its tuberous roots were the size of peas, and of a very bitter taste. One league from the village of Pisacoma, towards the north-east, begins the plain which extends along the south-western shore of the lake of Titicaca, and is said to continue in a southern direction along the Rio Desaguadero up to the mountain-knot of Porco (about $19^{\circ} 30'$ S. lat.). The mountain-ridge on each side of the lake is composed of red sandstone. This plain is little cultivated, and as it is at least 13,000 feet above the sea, agriculture is limited to a few objects. The principal are potatoes and quinoa (*Chenopodium quinoa*, L.), rye, barley, and oats, but they do not ripen to seed.

The hordes of domestic animals are numerous, consisting of llamas, sheep, horses, mules, asses, pigs, and a few cattle.

Near the small village of Piche-pichun, the silver mines were formerly very rich. Two leagues before reaching Ilave, on the shores of the lake, he came to the great road, called Camino del Rey, made in the reign of the tenth Inca, which runs round the whole lake and as far as La Paz. It is built of stone, from four to five yards wide, and sometimes several feet above the surface; but is now in so bad a state that it is generally avoided. From Ilave, which lies near the mouth of the river of that name, he passed along the lake through Acora, a town of 3000 inhabitants, and Chuquito, of 5000, to Puno. To Puno, Dr. Meyen, as well as General Miller, assigns 9000 inhabitants, but Mr. Pentland only 5000 (in 1827).* The lake, Dr. Meyen says, is commonly

* In "Annuaire" for 1830.

called Laguna de Puno, and that the name of Titicaca is only known to a few educated persons; nor is it known which of its numerous island was formerly called Titicaca. It appears dotted with small steep islands.

"The low banks of the lake," he continues, "are lined with rushes; and farther inward its waters are covered with *Myriophyllum chuquicense*, a new species. Rushes are here a plant of great utility, being employed by the natives almost for as many uses as the bamboo in the East Indies. They supply here the place of wood, which is wanting throughout the whole valley of the Desaguadero. The huts of the poor are made of rushes, as also mats for the floor and bed-covers. The boats, with which the rivers and the lake are navigated, are also made of rushes twisted together; the rudder and the mast alone are of wood, and form one of the most valuable possessions of the poor natives. These boats are frequently made with great taste and ingenuity. The smaller ones carry only three or four persons. The larger venture to some distance from the banks of the lake, which, even in calm weather, is subject to a heavy swell. The lake abounds with fish and waterfowl."

The lake of Titicaca is, according to Mr. Pentland, 12,795 * feet above the level of the sea, and Puno, 12,832 feet. Though higher than the plain of Tacora, Dr. Meyen found the temperature of the air not so low as there; and he considers this circumstance justly as a confirmation of the observation, that the temperature of an extensive table-land is always higher than that of the declivity of a mountain situated at the same elevation above the sea. Here follow some observations on the climate of the valley of the Desaguadero, extracted from papers sent by Mr. Pentland to Baron Humboldt, and by him communicated to Dr. Meyen. As we are not aware that these observations have ever before been published, we would direct attention to them, as we have not space to extract them.

As the culture of Indian corn does not succeed above an elevation of 12,000 feet, nor that of the lucern at 11,000 feet, neither of these plants is grown in the valley of the Desaguadero. Dr. Meyen has inserted some observations of the naturalist Rivero, drawn from his work, "*Memorial de Ciencias Naturales*," respecting the different elevations at which several plants are cultivated on the Andes; but for which we have no space.

The mines of the province of Puno, in the seventeenth century, were only inferior to those of Potosi. They were afterwards neglected, and only towards the end of the last century they again began to be worked with activity. In 1805 they yielded 96,528 marcs of silver. The annual average produce between 1796 and 1820 amounted to nearly 30,000 marcs: since that time they have

* Journal of Geographical Society, Vol. V.

been again neglected; and in April 1831 only one mine was worked which belonged to an Englishman.

From Puno the author returned to the sea by Arequipa. After having traversed the low ridge, which encloses the plain of Puno at a distance of from two to three leagues from the lake, he came to a plain of uneven surface and of considerable extent, covered with a fine sward of grass, on which herds of llamas and sheep were pasturing. In the valley-like depressions of this plain, flow some small rivers to the Rio Jussecano, which runs in a deep bed between rocks, and is one of the largest rivers falling into the lake of Titicaca, probably the same which by Mr. Pentland is called Rio de Lagunillas. One of its sources is in an alpine lake, situated near the road, which is called Laguna Compuerta; and not far from it is another lake called Lagunilla, whose elevation is according to Rivero 15,255 feet above the sea. Near these lakes extend some plains yielding excellent pasture ground; then follow plains, with scanty vegetation, until the highest part of the pass called the Altos de Toledo is attained. The elevation according to Mr. Pentland is 15,528 feet above the sea; Rivero found it somewhat more than 150 feet higher. Near it rise some steep, conical hills to the height of about 500 feet, and these more correctly are called Altos de Toledo. The temperature here was very low, and at half-past four o'clock ice began to be formed on the waters, though the sun had not yet set; yet the vegetation indicated a higher mean temperature than at the pass of Gualillas. S.W. of the pass stands the volcano of Uvinas (or Uvillas), which was nearly bare of snow, and had an immense crater on the east side. Hence the author proceeded by a steep descent to Pati, more than 1000 feet lower (Pentland 14,402 feet, Rivero 14,167 feet above the sea). In the morning the whole country was covered with ice and hoar frost. Between this place and Apo, seven leagues distant, he crossed a level plain, five leagues in length, covered by a thick stratum of white clay, but entirely destitute of vegetation. Apo, according to Mr. Pentland, is only forty-nine feet lower than Pati. The distance between Apo and Arequipa is only eleven leagues by the road, probably only eight leagues in a straight line; but the difference of their elevation is not less than 6556 feet. The country is almost entirely destitute of vegetation.

"*Arequipa* is situated in a widely-extended vale, everywhere inclosed by mountain-ridges. On the east rises the high range of the Andes, with a few snow-capped peaks. To the north-east rises the Volcan de Arequipa, whose conical peak, standing quite isolated, reaches to more than 6000 feet above the adjacent ridge; the south-western side of its summit also retains perpetual snow. To the west of the volcan extend the Montes de Charcani, which are full 3000 feet lower; yet these heights are always covered with snow. The ridges, which inclose

the valley on the west and on the south, do not rise to any height, yet the Alto Primero, on the south-west attains a considerable elevation. The vale is watered by the Rio del Volcan, also called Rio Chila, on the bank of which the town is built. This river rises in the Andes, flows round the base of the volcan, passing between it and the Montes Charcani, and then enters the level ground of the vale. Its banks are very steep, and covered with luxuriant vegetation. Two leagues below the town it is joined by the Rio de Socovaya, and hence is called the Rio de Arequipa.

"Though this valley is very fertile, it offers little variety to the eye of the traveller, there being few trees, and the surrounding mountains scantily covered with vegetation."

Dr. Meyen attempted to ascend the volcano of Arequipa, but did not attain its summit, being seized by the *sorocho*. On quitting Arequipa he went over a rather desert country, till he passed the Rio de Arequipa, which flows through a wide, fertile valley, thence over the ridge called *Alto Primero*, 1000 feet above the plain. Except some species of cactus, no plants are found on these heights. Immediately beyond he crossed another ridge, called *Alto Segundo*—no plant, no insect, no bird was to be seen. A third mountain-ridge succeeds of a similar description, named *Cuesta de Hedrachilar*; three hours hence he reached *Tambo*, 2842 feet above the sea, and where there is a spring and some gold mines: thence he entered on the *Pampa Grande*, a level plain covered with sand, without any rock, water, or trace of vegetation.

This desert, which may have an elevation of about 2000 feet above the sea; extends westward to the chain of hills which skirt the shores of the Pacific; its surface offers a very remarkable appearance.

"Everywhere the sand is formed into waves representing the figure of a scythe, its concave side lying to the north by west. Their extremities from 20 to 70 paces distant from each other, and the height of the hillocks varying between 7 and 15 feet. On the convex side the descent is very gentle, but on the concave, or interior side, these hillocks rise at an angle of 75° or 80° . The surface of the exterior side is not smooth, but a little undulating. The distances at which these sand-hills stand from one another differ; sometimes two or three of them are so close, that their points are united together. In the middle of the Pampa there is a space from 100 to 200 yards wide, where the concave side by degrees turns towards the west, till it faces due west; but a little farther on they return to the former position of N. by W."

Dr. Meyen is somewhat puzzled how to explain the formation of these sand-hills and thinks they are not met with in any other part of the globe. But L. Pottinger found a very similar kind of sand-hills, covering a considerable portion of the great desert of Beloochistan.

The chain of hills which divides the Pampa Grande from the sea is about four leagues wide, and is partly covered with plants and low shrubs, among which rise numerous cacti in the form of candelabra. Having traversed this chain, which in some parts rises to a considerable height, Dr. Meyen arrived at the Port of Islay, the new harbour of Arequipa.

From Islay Dr. Meyen sailed to Callao. In this passage he found that along the coast of Peru, between 15° and 16° S. lat., the temperature of the water instead of increasing, in the short time of four hours decreased about 2° Fah. He gives also the observations made in 1826 by Baron Dirckinck von Holmfeldt on the same subject, and sent by him to Baron Humboldt, which are worthy of notice. Baron Dirckinck found the temperature of the water in the harbour of Callao in March, 67° , whilst without the current it rose to from 79° to 85° .

Dr. Meyen visits Lima, and describes its scientific and literary institutions; he also determined its long. at $77^{\circ} 8' 30''$ W. of Greenwich, by an eclipse of one of Jupiter's satellites. From Peru Dr. Meyen visited the Sandwich Islands, and passed some time at Oahu; he made frequent excursions from the town of Honoruru into the interior; visited all the ranges of mountains which traverse the island, and gives some account of the four volcanic craters. From the Sandwich Islands Dr. Meyen visited Canton, and then Manilla, where he obtained permission to visit the interior of the Island of Luçon, a favour rarely granted to foreigners, and only to him as a naturalist. He made two excursions, one to the cavern of San Matteo, and the other to the Laguna de Bay.

The visit to San Matteo, which seems to be a large cavern in a limestone mountain named *Sablayan*, estimated at 1500 feet above the sea, is curious and well worth notice; and also that to the *Laguna de Bay*, or Bahia—which is described as having its western shores low, fertile, and populous. Islands in the middle of the lake attain the height of 300 feet, covered with forest trees; while on the eastern shores the mountain ranges rise from 4000 to 7000 feet, whence descend to the lake numerous rapid streams. A rich mould and luxuriant vegetation were found in all the districts visited. The climate Dr. Meyen thinks healthy, and not subject to severe diseases, although in so low a latitude as 15° north. The whole of the 14th and 15th Chapters, containing an account of the island of Luçon and its native inhabitants, is curious and valuable from the dearth of information respecting it, but want of space forbids longer extracts. Dr. Meyen concludes with a set of meteorological tables registered four times a day during his whole voyage; and in a short appendix gives his observations on the specific gravity of salt water in the various spots he visited during a space of three years, and in a voyage round the globe.